DOCUMENT RESUME

ED 219 247 SE 038 745

TITLE	Academic Science/Engineering Employment Increased 3% between 1980 and 1981. Science Resources Studies Highlights.
INSTITUTION	National Science Foundation, Washington, D.C. Div. of Science Resources Studies.
REPORT NO	NSF-82-312
PUB DATE	18 Jun 82
NOTE	5p.; May not reproduce well due to colored print.
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	College Faculty; *College Science; Employed Women; Employers; *Employment Patterns; *Employment Statistics; Engineering; *Engineering Education; *Engineers; Environmental Education; Higher Education; Mathematics Education; Science Education; *Scientists

ABSTRACT

Data presented in this report are derived from the National Science Foundation's (NSF) 1981 Survey of Scientific and Engineering Personnel Employed at Universities and Colleges. Highlights of the survey indicate that: 1) science and engineering (S/E) employment in the higher education sector increased 3-percent between January 1980 and January 1981; 2) increases in S/E employment varied widely by institution, with 2-year institutions (responding to growing enrollments) reporting a 7-percent gain in S/E employment; 3) distribution of academic scientists/engineers by field has not changed significantly since 1973, with largest proportions (41-percent) in the biological sciences and smallest (3 percent) in the environmental sciences; 4) expansion in employment of academic professionals occurred in all major S/E fields but was most evident in mathematical/computer sciences (increasing 8-percent in 1981); 5) use of part-time S/E staff increased among almost all S/E disciplines, accounting for 20-percent of all scientists/engineers employed in universities and colleges in 1981; 6) the number of women scientists/engineers employed in academy rose 6-percent between 1980 and 1981 (compared to the 2-percent rise reported for male counterparts); and 7) the number of academic scientists/engineers engaged in research and development activities rose only 1-percent, with many doctorate-granting institutions utilizing graduate research assistants in the performance of research. (Author/JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED219247

SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D.C. 20550 JUNE 18, 1982 NSF 82-312

Academic Science/Engineering Employment Increased 3% Between 1980 and 1981

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY National Science Foundation TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

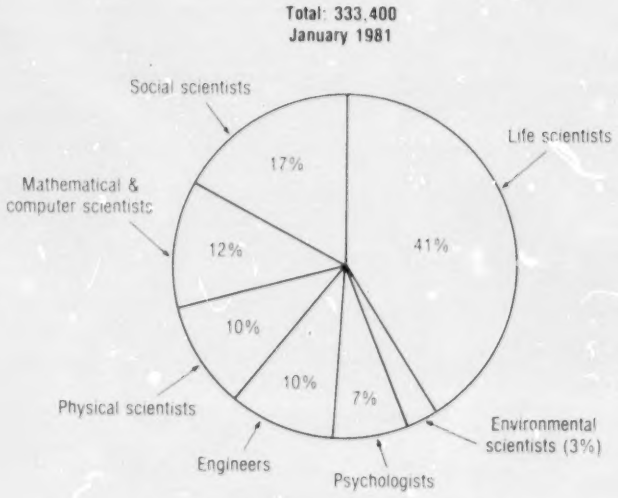
U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

This report is based upon the findings of the National Science Foundation's (NSF's) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1981. The survey was mailed to approximately 2,200 universities and colleges offering programs in the sciences and/or engineering. Estimates for nonresponse represent 19 percent of the total number of scientists and engineers employed in higher education institutions.

Highlights

- Science and engineering (S/E) employment in the higher education sector increased 3 percent between January 1980 and January 1981, matching the average annual growth rate of the previous 7-year period, 1973-80. Over 333,000 S/E professionals—about 12 percent of the Nation's scientists and engineers—were employed either full or part time in the Nation's universities and colleges in 1981. Part-time S/E employment made up more than one-half the 1980-81 increase.
- Increases in S/E employment varied widely by type of institution. Doctorate-granting institutions, where two-thirds of the S/E professionals are employed, reported a 3-percent increase between 1980 and 1981. S/E employment at master's-granting institutions was up less than 1 percent, while bachelor's-granting institutions reported a 2-percent increase during the same time. Two-year institutions, in response to growing enrollment, reported a 7-percent gain in S/E employment.
- The distribution of academic scientists and engineers by field has not changed significantly since 1973. The largest proportions in 1981 were concentrated in the life sciences, 41 percent, and the smallest in environmental sciences, 3 percent (chart 1). Mathematical/computer scientists grew at the fastest pace, accounting for a 12-percent share of the total in 1981 compared to 9 percent in 1973.
- The expansion in employment of academic professionals occurred in all major S/E disciplines, but was most evident in the mathematical/computer sciences—which increased 8 percent in 1981. Much of this growth can be traced to a 19-percent gain in part-timers.
- The use of part-time S/E staff has increased among almost all S/E disciplines, accounting for 22 percent of all scientists and engineers employed in universities and colleges in 1981. This reflects the efforts of institutions to maintain a sufficient number of S/E personnel in the face of rising enrollment; fiscal restraints that impose limitations on the hiring of full-time staff; and, for some fields, professional salary levels that are not competitive with industry.

Chart 1. Scientists and engineers employed at universities and colleges by field



SOURCE: National Science Foundation

- The number of women scientists and engineers employed in academe rose 6 percent between 1980 and 1981, as compared to the 2-percent rise reported for male counterparts. Men, however, still made up 80 percent of the total S/E work force in higher education.
- The number of academic scientists and engineers engaged in R&D activities, as measured in full-time-equivalent (FTE) terms, increased only 1 percent between 1980 and 1981, the same average rate reported annually since 1978, but substantially lower than the 4-percent average annual growth rate reported between 1973 and 1978. There is an increasing tendency among doctorate-granting institutions to utilize graduate research assistants in the performance of research.

Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies.

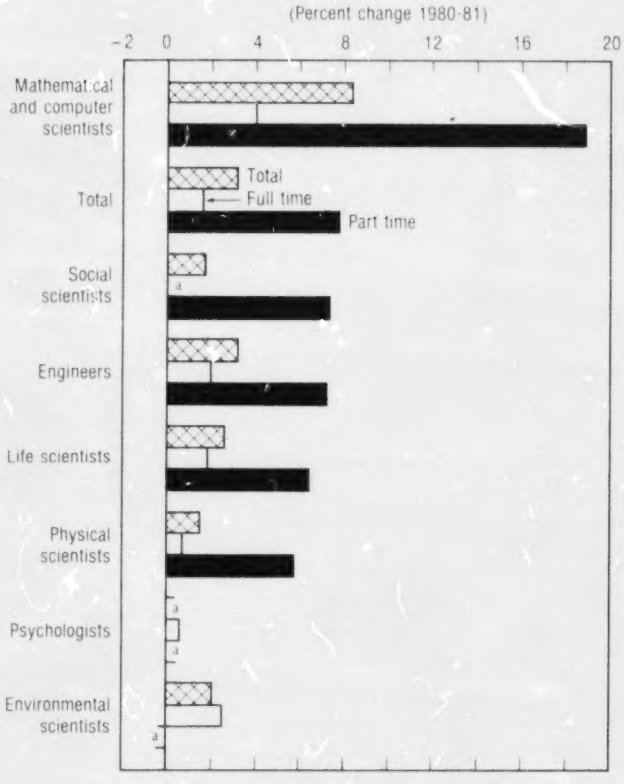
Employment Status

There has been a steady rate of growth in both full- and part-time S/E employment since 1973 as enrollment in higher education swelled and academic R&D performance grew. During the 1973-80 period part-time employment of S/E professionals rose at a more rapid rate than full time—an average annual rate of 5 percent compared with 2 percent. The 8-percent increase in part-timers between 1980 and 1981 was more than four times the growth rate of full-timers (chart 2). Although the part-time increase was distributed among all types of institutions surveyed, the most noticeable rise occurred at 2-year institutions, where the number grew 14 percent between 1980 and 1981, double the 7-percent growth rate in part-time employment in doctorate-granting institutions.

In 1981, full-time S/E personnel represented more than three-quarters of the total number of scientists and engineers employed in higher education, but an increasing use of part-time S/E faculty was evident in all disciplines except the environmental sciences and psychology (chart 3). The largest relative jump was seen in part-time employment among mathematical/computer scientists, up 19 percent between 1980 and 1981, compared to a 4-percent rise in full-time professionals and an 8-percent overall increase in this field. According to a recent NSF-funded study, universities and colleges report growing graduate and undergraduate enrollment in computer science but are experiencing difficulty in providing the required numbers of faculty because of attractive industry job offers received by young instructors.[1] When these instructor positions are vacated, some institutions are turning to part-timers and graduate teaching assistants for replacements.

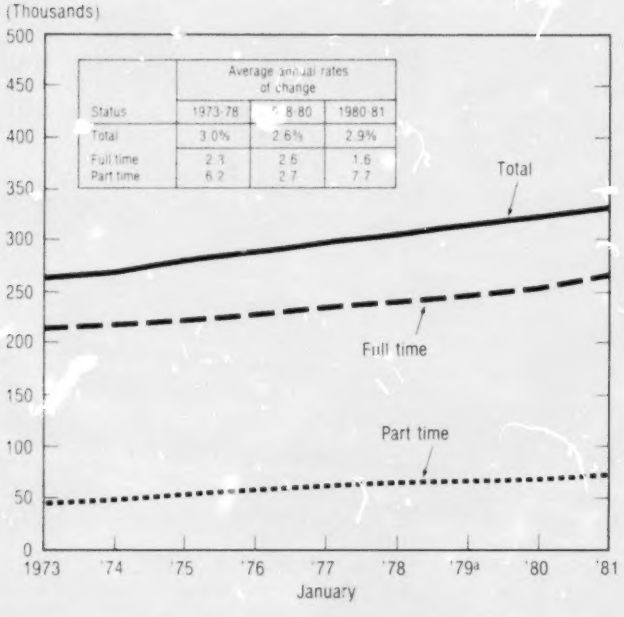
The 7-percent increase in part-time engineering staff was more than three times that of full-timers. A recent NSF study

Chart 3. Scientists and engineers employed at universities and colleges by field and status



[a]Less than 0.5 percent change.
SOURCE: National Science Foundation

Chart 2. Scientists and engineers employed at universities and colleges by status



Status	Average annual rates of change 1973-78	1978-80	1980-81
Total	3.0%	2.6%	2.9%
Full time	2.3	2.6	1.6
Part time	6.2	2.7	7.7

[a]Estimated, based on data collected from doctorate-granting institutions only.
SOURCE: National Science Foundation

of engineering faculty positions found a significant number of vacancies ". . .at the beginning of the 1980/81 academic year. Deans reported that about 1,600 of 16,200 full-time slots were unfilled and that two-fifths of these had been vacant at least one year. . . .To reduce the burden on full-time faculty, about two-thirds of the colleges experiencing greater staffing difficulty increased their use of graduate teaching assistants or part-time faculty."[2]

Overall, the portion of full-time faculty holding tenured positions in most S/E fields has increased since 1973. Consequently, there has been a decline in the number of full-time faculty positions available for recent recipients of doctorate degrees—those holding their degrees for 7 years or less. A recent NSF study of approximately 1,900 S/E doctorate-level departments found that the ". . .proportion of recent doctorates [on the faculty]. . .was 21 percent in 1980—down from 28 percent in 1974 and 39 percent in 1968."[3] The result is that those entering the academic S/E work force are increasingly employed outside the tenure track in part-time or short-term positions.

Full-time S/E employment at 2-year institutions increased by about 3 percent between 1980 and 1981, up from the average yearly rate of 1 percent for the previous 7 years. These 1973-81 employment increases contrast with growing enrollment reported by these institutions throughout this period, up an average of about 6 percent per year between

1973 and 1981.[4,5] Part-time S/E professionals are being used to help meet the demand created by the growing enrollment in these schools. For the 7-year period 1973-80, part-time S/E ranks increased at an average annual rate of 9 percent, with the largest gains occurring in the mid-seventies. Between 1980 and 1981 part-timers showed a 14-percent increase, the first substantial rise since 1978.

Research Activity

The number of FTE academic scientists and engineers engaged in separately budgeted research and development rose 1 percent in 1981 to over 57,000, 8 percent of the national total. This increase matched the average yearly gain since 1978, but was down from the average 4-percent per year increase between 1973 and 1978.[6] Over the 1978-81 period, academic institutions showed the slowest rate of increase in FTE R&D scientists and engineers among all economic sectors except for the Federal Government which showed little or no change.[7] The growing practice by doctorate-granting institutions of utilizing graduate research assistants (up 4 percent per year between fall 1974 and fall 1980) may be offsetting the use of full-time professional staff for academic R&D efforts.[8] Graduate research assistants are not included in the FTE counts.

Women in Academic Science/Engineering

The number of women S/E professionals employed in higher education increased 6 percent between 1980 and 1981, three times the rate of increase for men. Over two-fifths of this gain can be attributed to women employed on a part-time basis. Nearly 20 percent of the academic S/E work force in 1981 were women. Women accounted for 13 percent of the national S/E work force in 1980, compared to over 44 percent of all professional and technical workers.[9,10]

In all major S/E disciplines, the proportion of women employed full time in higher education gained steadily between 1974—when data by sex were first collected—and 1981; the rate of annual growth averaged approximately 5 percent overall. While women continued in 1981 to be most heavily represented in psychology (26 percent) and the life sciences (23 percent), their highest annual rates of growth occurred in engineering (13 percent) and the environmental sciences (12 percent) (table 1). These high rate gains, however, are somewhat deceptive since the absolute number of S/E women employed full time was small compared to the number of male counterparts. In engineering fields, there were only 800 women employed as engineers in 1981 (or 3 percent of the total) compared to over 26,000 men. Thus, the 1974-81 average yearly increase of 13 percent in women employed as engineers was represented by a rise of less than 500 women nationwide. In the environmental sciences, an average gain of less than 60 women per year since 1974 brought their numbers to 750 in 1981, representing a 9-percent share of the total.

Although women continue to gain in numbers employed in academic science and engineering, their salaries have not kept pace with those of men at the same degree level, according to an NSF survey. For women Ph. D.-holders employed as scientists and engineers in educational institutions, the survey found that the median annual salary was $2,600 lower or 87 percent of that for men in 1973, while in 1979, the latest data available, their median annual salary was $4,600 lower, only 83 percent of the median salary for men.[11] Salary differences between women and men reflect many factors, including field of employment, age, and years of experience. In general, women are younger than their male colleagues and have fewer years of professional experience. According to an NSF-funded study, however, some salary differences remain, even after controlling for years of experience and field of employment.[12]

The 20 Leading Institutions

At the 20 institutions employing the largest number of scientists and engineers, total S/E personnel rose approximately 1 percent from 1980 to 1981 (table 2). These doctorate-granting institutions employed about 17 percent of the total academic S/E work force and 29 percent of the total full time equivalents engaged in R&D activities.

Table 1. Women as percent of full-time scientists and engineers employed at universities and colleges by field: 1974 and 1981

Field	January				Average annual percent change 1974-81
	1974		1981		
	Total S/E employment (thousands)	Women as percent of total	Total S/E employment (thousands)	Women as percent of total	
Total	218.4	15%	258.8	18%	5%
Engineers	22.8	1	27.0	3	13
Physical scientists	26.8	7	28.2	9	4
Environmental scientists	6.6	5	8.6	9	12
Mathematical and computer scientists	22.2	13	27.1	16	7
Life scientists	88.5	20	110.1	23	5
Psychologists	15.0	21	16.8	26	5
Social scientists	36.6	16	41.2	19	4

Source: National Science Foundation

Table 2. Twenty leading institutions employing scientists and engineers: 1980-81

Institution	January		Percent change
	1980	198	1980-81
Total, all institutions	324,100	333,400	3%
Total, leading 20 institutions	55,729	56,520	1
1. Harvard University	5,567	5,822	5
2. University of Wisconsin-Madison	3,764	3,807	1
3. Ohio State University	3,648	3,734	2
4. University of Minnesota	3,620	3,655	1
5. Johns Hopkins University	3,303	3,323	1
6. University of Michigan	3,288	3,316	1
7. Louisiana State University	3,067	3,053	(*)
8. University of Illinois--Urbana	2,343	2,563	9
9. University of Washington	2,529	2,521	(*)
10. University of California-Los Angeles	2,420	2,503	3
11. Cornell University	2,453	2,486	1
12. Massachusetts Institute of Technology	2,366	2,319	-2
13. University of Florida	2,216	2,257	2
14. Pennsylvania State University	2,178	2,227	2
15. Texas A&M University	2,168	2,216	2
16. University of Kentucky	2,230	2,215	-1
17. Columbia University-Main Division	2,125	2,188	3
18. New York University	2,050	2,136	4
19. Yale University	2,159	2,093	-3
20. University of California-Berkeley	2,235	2,086	-7
Total, all other institutions	268,300	276,900	3

*Less than 0.5 percent change.

SOURCE: National Science Foundation

* * * * * * *

The report, *Academic Science: Scientists and Engineers, January 1981* (Detailed Statistical Tables) (NSF 82-307), can be obtained from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550. For information on availability of data tapes, please call (202) 634-4673.

Footnotes

[1]Robert G. Gillespie, *Computing and Higher Education: An Accidental Revolution*, final report of NSF Grant No. SED 78-25790 (Seattle: University of Washington, 1980), pp. 4, 23-28.

[2]National Science Foundation, "Engineering Colleges Report 10% of Faculty Positions Vacant in Fall 1980," *Science Resources Studies Highlights* (NSF 81-322) (Washington, D.C., Nov. 2, 1981), pp. 2-3.

[3]National Science Foundation, "Science and Engineering Faculty With Recent Doctorates Fell to One-Fifth of Total in 1980," *Science Resources Studies Highlights* (NSF 81-318) (Washington, D.C., Oct. 30, 1981), p. 1.

[4]Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1977-78* (NCES 78-402) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1978), table 81, p. 82.

[5]Department of Education, National Center for Education Statistics, "Fall Enrollment in Colleges and Universities: 1981, Preliminary Estimates," *Early Release* (NCES 82-104) (Washington, D.C., Nov. 30, 1981), table A, p. 4.

[6]National Science Foundation, "Academic Employment of Scientists and Engineers Increased 16% Between 1978 and 1980," *Science Resources Studies Highlights* (NSF 81-315) (Washington, D.C., Aug. 3, 1981), p. 2.

[7]National Science Foundation, *National Patterns of Science and Technology Resources, 1982* (NSF 82-319) (Washington, D.C.: Supt. of Document, U.S. Government Printing Office, 1982), table 14.

[8]National Science Foundation, *Academic Science: Graduate Enrollment and Support, Fall 1980* (Detailed Statistical Tables) (NSF 81-330) (Washington, D.C., 1982), table C-17, p. 82.

[9]National Science Foundation, *U.S. Scientists and Engineers, 1980* (Detailed Statistical Tables) (NSF 82-314) (Washington, D.C., 1982), in press.

[10]Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, January 1981).

[11]National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1979* (Detailed Statistical Tables) (NSF 80-323) (Washington, D.C., 1980), table 3, p. 4.

[12]Ahern, Nancy C. and Elizabeth L. Scott, *Career Outcomes in a Matched Sample of Men and Women Ph.D.'s* (Washington, D.C.: National Research Council, 1981), p. 41.

National Science Foundation
Washington, D.C. 20550

Official Business
PENALTY FOR PRIVATE USE, $300

RETURN THIS COVER SHEET TO ROOM 233, IF YOU DO NOT WISH TO RECEIVE THIS MATERIAL ☐, OR IF CHANGE OF ADDRESS IS NEEDED ☐ (INDICATE CHANGE, INCLUDING ZIP CODE).

Postage and Fees Paid
National Science Foundation

THIRD CLASS
Bulk Rate

U.S.MAIL

E4623

G SUNDSTROM
ADUIS LIBR
ERIC FACILITY
4833 RUGBY AVE
BETHESDA MD 20014

NSF 82-312